

On the Anatomy of certain Forms of Australian Entomostraca,
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IN my researches in 1850-5, among the Fluviate Entomostraca in the neighbourhood of Sydney, I was fortunate in meeting with several new species, a detailed description of which appeared in the Papers and Proceedings of the Royal Society of Van Diemen's Land. In Vol. III., Part I., 1855, a list and brief description of 43 species was given, all but two of which (*Lepidurus viridis* Baird, and *Daphnia mucronata* Muller) were, as far as I am aware, new to science.

I propose in the present paper to refer to the anatomy of these species, accompanying the description with figures, and selecting those of which the anatomy is either unknown, or appears to differ from the description already given of similar species in other places.

LIMNETIS MACLEAYANA. (Pl. XI.)

The Fluviate Phyllopora of Australia, as far as at present known, for I am not aware that any additions have been made since 1855, include the genera *Lepidurus*, *Limnadia* and *Limnetis*. The lovely genus *Chirocephalus* has not as yet a place in our Australian Fauna. In addition to the above we have the very beautiful *Artemia proxima* (*nihii*) in the Salt Pans at Newington. The Marine Phyllopora have yet to be worked out.

The genus *Limnetis* was first described by Loven, from a South African species, by the name of *L. Wahlbergii*. The following is M. Loven's description of the genus :—

LIMNETIS. *Loven.*

Limnadiæ et Cyzico affine, antennis bi-articulatis, cauda truncata, appendicibus mobilibus facie inferiore destituta.

The following comparison of the three genera of *Limnadiadæ* will at once point out the distinctness of this genus from the other two which have long been known and minutely described.

	LIMNADIA.	ISAURA OR CYZICUS.	LIMNETIS MACLEAYANA.
Beak	short	produced	produced
Carapace	with shield-like flaps	bivalve	bivalve
Striae	few	many	none
Joints of antennæ ..	4—8	many	two
Basilar portion of Rami	8—10 jointed	many jointed	two jointed
Branches of ditto ..	8 or more jointed	many jointed	many jointed
Tridactyle feet of male	2 pair	2 pair	one pair
Branchial feet of female	17 pairs	21—27 pairs	11 pairs
Lobes on ditto	9	9	10
Last segment of ab- domen	with immoveable spines	with moveable spines	spineless but hairy
Cæca	numerous	none	numerous

In *Limnetis MacLeayana* the antennæ are bi-articulate, the second joint being covered on the upper surface with numerous papillæ, from each of which a minute seta springs. The rami are composed of a basilar portion consisting of two joints, the second of which carries two multiarticulate arms, from each joint of which a long plumose seta proceeds. The rami are the sole organs of locomotion. The tridactyle feet of the male are two in number, the clasping joint being very strong. The branchial legs are 10 pairs in the male, 11 pairs in the female, and are composed of 10 distinct lobes, and differ principally from *Isaura* and *Limnadia* in having a second hairless lobe on the external edge—an important particular in which it agrees with *Artemia*.

The exact use of these hairless lobes, which exist in the *Daphniadæ* and (certainly some *Lynceidæ*) as well as in the *Phyllopoda* and *Apus* does not appear to have been clearly made out. They are generally protected from injury by a strong hairy lobe directed backwards. It is this lobe, in our present species, on the 7—10 branchial legs which carries the ova.

Some very young specimens were captured near Denham Court in the month of July. Adults were obtained in one of the Botany swamps (since drained) in the beginning of October, at which time the young ones captured in July had attained the adult

size. Before the end of October all had disappeared from the swamp; but some remained in my aquarium alive and well until the end of November. I have also found the species at Paramatta.

Their manner of swimming very much resembles that of the *Lynceidæ*, a quick succession of short jerks. When copulation takes place, the male seizes the female between its beak and the ventral edges of its carapace, and swims about in a most excited manner—the shell of the female being at this time wholly closed. After a time she begins to open her shell, when the clasping legs of her consort seize the edges.

DAPHNIA CARINATA.

The *Daphniadæ* are well represented in the neighbourhood of Sydney by at least seven species belonging to the genera *Daphnia* *Macrothrix* and *Moina*. Of these, the species named above is by far the largest and one of the most common. It is subject to very great variations, which appear to be constant in particular localities. It is easily bred, and, from its size, easily observed in an Aquarium.

Plate XII. contains an accurate representation of all the branchial legs of the female. They much resemble the corresponding parts of *D. Schæfferi* as figured in Baird's "*British Entomostraca*." There is, however, one important difference—or rather addition—in my figures, viz., that in all these the hairless lobe appears corresponding to that already described in the anatomy of *Limnetis*. In Mr. Baird's plate this lobe does not appear in the 1st, 2nd, and 3rd pair of legs; the upper portion of it is drawn in the figure given of the 4th, and the whole of it in that of the 5th.

In the *Phyllopora*, it is remarkable how through all the branchial legs the same lobes may be traced, so that the last of 11, 17, or 27 pairs exhibits a very close correspondence with the 1st and 2nd. The normal number of lobes may be traced even in the clasping legs of the male. But in *Daphnia* this rule does not obtain. With the exception of the 3rd and 4th the *dissimilarity* is as remarkable. Even in the number of lobes as well as in their arrangement, there is a considerable difference.

In the next species to be noticed we shall observe a return in some degree to the remarkable unity of form observable in the legs of the *Phyllopoda*.

EURYCERCUS COOKII.

Of the *Lynceidæ*, I described, in the Transactions referred to, twelve species belonging to the genera *Eurycercus Chydorus* and *Alona* of Baird, and *Dunhevedia*, a new genus. These genera must be considered as merely provisional, being all founded upon the shape of the carapace, and, in some instances, that of the last segment of the abdomen, without any reference to that of the branchial legs. Hence our present species will come under the same generic name with the large European species *Eurycercus lamellatus* (Baird), notwithstanding a remarkable difference in the branchial legs, as, for example, the last leg of *E. lamellatus* is rudimentary, whilst that of *E. Cookii* is as well developed as the rest.

The present species is the largest hitherto discovered of the Australian *Lynceidæ*. I obtained it from a large pond among the Botany swamps, and have also received it from the neighbourhood of Brisbane. It usually feeds near the edge of the pond; but at the approach of an intruder it swims out in a wavy line towards the deeper water, when its size and deep chocolate colour render it an easy prey.

Plate XIII. contains a correct representation of the details of the anatomy of this very interesting form. The other parts resemble the figures in Mr. Baird's plate of *E. lamellatus* so closely that a description would be but a repetition of his account. My drawings of the branchial legs are, however, very different to his. Each leg consists of two parts, the outer part, probably devoted to purposes of respiration; the inner intended, like the inner lobe of the *Phyllopoda*, for conveying food to the mouth.

An inspection of the Plate will at once point out the remarkable resemblance existing between all the legs, except indeed the first pair. The wide branchial plate exists in all, carrying the curious stout plumose setæ and protecting the hairless lobe; on the inner side the lobe next the branchial plate is variously mo-

dified, but all these legs have the innermost lobe armed with a row of strong setæ arranged transversely, and evidently intended to convey the food to the mouth by generating a current in that direction. In this transverse arrangement of the setæ of this lobe we again trace a resemblance to *Limnadia*.

The hairless lobe in this species is very small as compared with that noticed in *Daphnia carinata*. It does not appear at all in Mr. Baird's Plate of *E. lamellatus*. I have already pointed out the remarkable difference in the last pair of legs from that figured in Mr. B.'s work.

The first pair appear to have been modified with a view to assist the animal in swimming, and help to account for its satisfactory progress in the water. The long finger on the 5th pair seems to be intended to assist in walking among the decaying vegetable matter in and among which the little creature obtains its food.

On the whole, the examination of the branchial legs of this species suggests the idea of a return towards the *Phyllopoda*. Most of the species of the *Lynceidæ* are so exceedingly minute that it is difficult to perform the operation of amputation; and without it the examination of these parts is quite impossible.

Let me suggest, in conclusion, that if any other observer should meet with a tolerably large species of the *Lynceidæ* he should make it the subject of a careful examination.

And one other suggestion I would make for the benefit of those members of our Society who live in Sydney or near the coast. And it is this—that the Marine Entomostraca are very numerous, exceedingly interesting, easily procurable, and, as far as our own species are concerned, quite unknown. I have drawings of a *Cypridina* and a few parasitic species (including at least one new genus) which are quite at the service of any who will take up the study.
